A CASE STUDY OF WATERSHED PROTECTION IN DOUGLAS COUNTY, GEORGIA

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Abstract. Prompted by tremendous local development in the 1980's, the Douglasville-Douglas County Water and Sewer Authority generated a comprehensive Watershed Management Plan designed to allow for controlled growth within the drainage basins tributary to the water courses used for the area's public water supply while preserving the short- and long-term integrity of those supplies. Building upon existing regulations, the plan offered a realistic approach relying on passive regulatory tactics rather than unreasonable monitoring attempts.

With the cooperation of state and local agencies, the plan was implemented in 1990 with five direct elements: 1) septic tanks, 2) building densities and zoning, 3) erosion and sedimentation control, 4) overland flow/non-point source discharge, and 5) low-flow water fixtures. Three indirect elements are also involved: 1) public education, 2) low-flow water fixtures, and 3) water quality monitoring. The following is an account of the program from the formation of the plan, conclusions, implementation of the program, and the problems and successes realized.

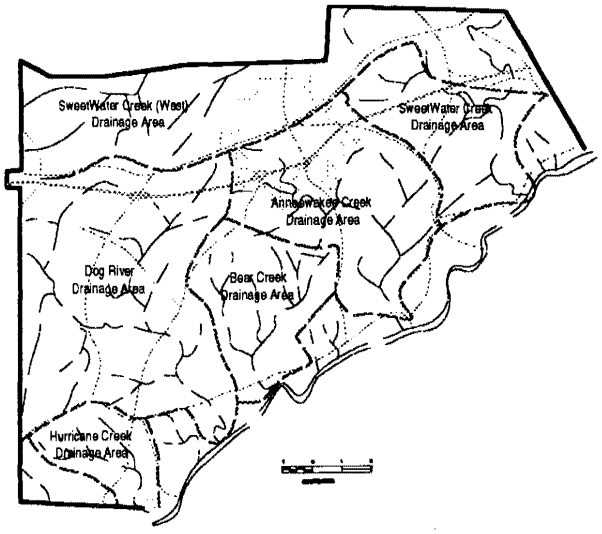
Study Area. Douglas County is one of nine metro Atlanta counties and is located 25 miles west of the city and 30 miles east of the Alabama-Georgia state line. The county encompasses 201 square miles and has a population of approximately 73,000 people, based on 1990 census data. The population has more than doubled since 1970 and is projected by the Atlanta Regional Commission to be 156,000 by the year 2010. In 1990, Douglas County was the 45th fastest growing county in the country. Development in the City of Douglasville and areas to the east have been typical suburban residential subdivisions and, with few exceptions, commercial to light industrial developments along state highways. A more rural environment exists in the western half of the county where one-third of the population resides.

PLANNING PROCESS

Select Reservoir Site. In developing the comprehensive Watershed Protection Plan, watershed selection was the first step in the process. The Water and Sewer Authority recognized that given projected population increases, additional water supplies would be necessary by the year 1995. Armed with this information, the Authority began to evaluate all locally available watercourses for possible use (see Map #1). The Chattahoochee River, which establishes Douglas County's southern and eastern border, is the largest watercourse in Douglas County. However, as the receiving stream for metro area wastewater treatment plant discharges, the Chattahoochee has been considered too polluted for use as a potable water supply for Douglas County. Sweetwater Creek, the second largest watercourse in the county, was already used as a raw water source for an incorporated area outside the county and was therefore unable to be used for the stated purpose. In addition, water quality in this urban stream was poor compared to other alternatives. Since Anneewakee Creek and Bear Creek were already being used for the county's water supply to their maximum potential, Dog River was the only remaining local option.

A detailed evaluation of the Dog River indicated that water quality was the best of all locally evaluated options and, if properly developed, could be used to meet Douglas County's water needs well into the next century. Consequently, the necessary funds and manpower were allocated to secure its use. The specific dam location and impoundment size were selected not only on a cost effective yield basis, but also to preserve the white water upstream of the impoundment area which is frequently used recreationally by rafters and kayakers.

Identify Problems. The next step in the process of designing the plan was problem identification. County zoning required larger lots in both the Dog River and Bear Creek Drainage Areas than in other portions of the county, consequently, the area was generally rural in nature with limited residential development and very few commercial and industrial facilities. Cognizant of what happened to water quality in the Chattahoochee River as well as the deterioration of water quality in urbanized areas of Douglas County, the Authority, with assistance from a private engineering consultant, identified elements that could adversely affect water quality to a point where water treatment practices could be impacted and ultimate



Map #1 - Drainage Basins

ly cause water cost increases to the consumer. This assumes of course that the stream could still be used for a potable water supply. Following the philosophy, "An ounce of prevention is worth a pound of cure," the Authority identified the major sources of potential pollution. They were: a) malfunction-ing septic systems, b) increasing population densities, c) erosion and sedimentation problems, and d) to a lesser degree, non-point sources and overland flow.

Selection Procedure. In addressing each of these issues, the plan first documented how each item should function under normal conditions. Problems that can arise when normal conditions are not maintained were identified next, and finally suggestions were made for preventative measures and resolutions to potential problems.

Interestingly, some potential solutions were mutually exclusive. For example, while it is commonly believed that a centralized sanitary sewer and treatment system provide better treatment than a septic tank if both are properly operated, the reality is that many sanitary sewer systems are not or cannot be maintained properly and become over capacity causing exfiltration to occur, particularly during wet weather events (U.S. Dept. of Health, Education and Welfare 1959). In addition, these large main sewer lines are typically constructed in lower elevations, many times immediately adjacent to streams so any overflow directly enters the watercourse. Even assuming a sanitary sewerage system functions properly, the effort to limit developmental densities renders the construction of a centralized system too costly an option for the private developmental community.

CAUSES OF WATER QUALITY PROBLEMS

The following is a brief description of the research performed in identifying each problem condition, as well as the negative side effects present due to these conditions.

Septic Tanks, On-Site Disposal Systems, Densities

Water quality testing was performed weekly over a four-year period on 28 locations throughout the county for turbidity, fecal coliform and pH levels. These tests revealed the fecal coliform count had increased in all basins for the period of the study indicating a continuing deterioration in water quality. Findings on Dog River appear in Chart #1 and are indicative of all of the basins studied. It was also concluded the more urban the area, the more polluted the stream, regardless of the existence of a centralized sewer system. A stream profile of Bear Creek (see Chart #2) illustrates the change in fecal coliform count by sample location and year. Point B-2 is downstream from a privately owned and operated package wastewater treatment plant. Point B-4 is downstream from a wastewater treatment spray application field and point B-5 is downstream from another privately operated wastewater treatment plant. All other points between B-1 and B-9 are downstream of subdivisions served by septic systems. B-10 is the raw water intake. The conclusions drawn from this research indicated that although septic tanks contribute to water quality deterioration, centralized disposal systems and population densities had a more direct and dramatic impact on water quality.

Erosion and Sedimentation Control

Research has shown that erosion and sedimentation can lead to the buildup of soil and sedimentation deposits into waters within watershed areas. In dry weather, stream turbidity in the areas sampled was generally below 20 NTU, however, in wet weather conditions this level increased dramatically (see Chart #3). This impact had resulted in a substantial siltation problem in the existing Bear Creek Reservoir (see Chart #4). In some areas the siltation occurred at the rate of almost a foot per year.

Overland Flow and Non-Point Source Discharges

Although one of the problems typically associated with overland flow is soil erosion, a literature review also indicated that urban storm water runoff has higher metals content than that of non-urban areas (United States, Environmental Protection Agency 9-1 - 9-18). The Authority's "first-flush" sampling program confirmed this fact with lead, zinc and copper found in higher concentrations in urban areas. It was suspected that these metals were

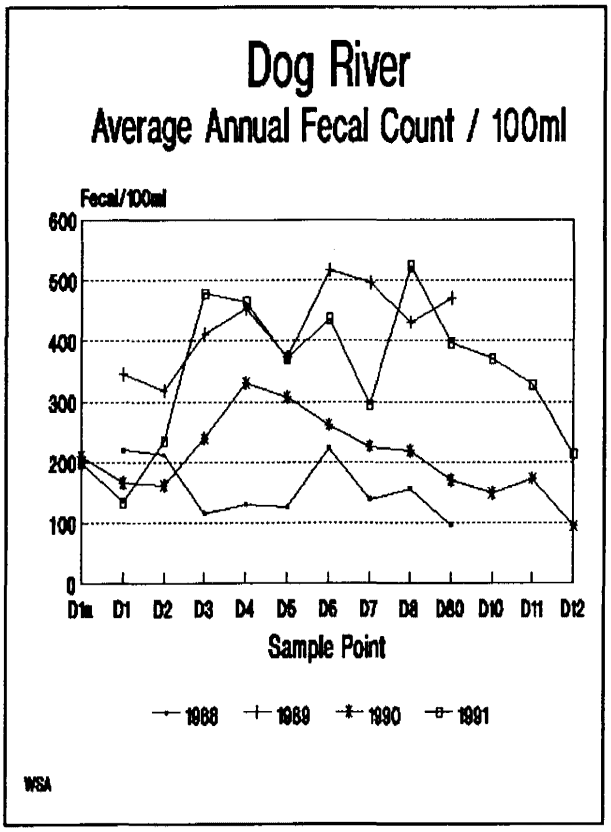


Chart #1

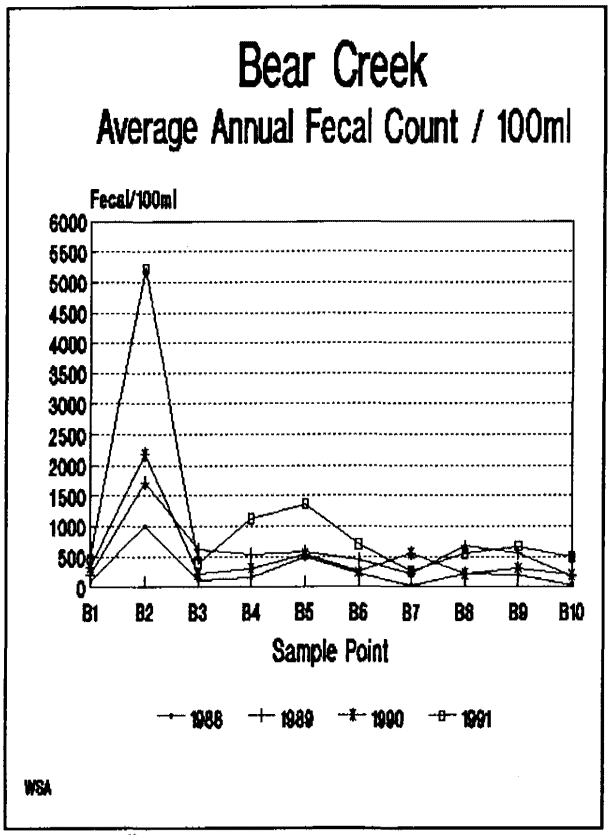


Chart #2

caused by use of wood preservatives, wood stains (copper), lead-based paint from older homes, oil and gasoline, as well as other petro chemical products (lead), galvanized fences, guard rails, nails and chains (zinc), among other sources.

Once the causes of water quality deterioration were identified, the next step in the development of the Management Plan involved finding solutions to eliminate or reduce these causes.

WATERSHED MANAGEMENT PLAN

In order to be comprehensive, the Management Plan recognized that addressing the sources of pollution is only part of the process to ensure an adequate and quality water supply for the future of Douglas County. In addition to the four direct elements identified as adversely affecting water quality, three indirect elements were also noted which can have a significant impact on preserving long-term water quality. These are public education, low-flow water fixtures and monitoring.

Septic Tanks, On-Site Disposal Systems

In order to ensure proper septic tank installation and operation, the plan outlines a program which includes both technical assistance and enforcement remedies. In addition to State requirements, the plan calls for the local permitting process to include the following requirements: (1) Topographical maps and site plans should be prepared and sealed by a registered land surveyor showing the location of the building, septic tank and absorption field, other related structures, as well as contour lines showing areas of proposed grading. (2) A minimum of three percolation tests should be performed in accordance with EPA standards for each absorption field location with the results certified by a registered surveyor and the location shown on the site plan along with the invert elevation of the percolation test. (3) The installation of the septic tank and absorption field should be certified by a registered surveyor or engineer. (4) A monitoring well should be installed in the absorption field for observing the ability of soil to absorb water, and this well must be checked annually to ensure that the absorption field is performing properly. (5) Septic tanks installed after 1991 should be inspected annually and pumped periodically (every 5 years) as a preventative maintenance measure.

Densities

Requirements established by Douglas County for zoning codes provide strict guidelines to prevent high density development in sensitive areas, as well as mandating significant undisturbed buffers along creeks and streams. Zoning ranges from a minimum one acre lot on parcels of land that are not adjacent to a stream, to minimum five acre lots with up to 300 feet of undisturbed natural buffers

for properties immediately adjacent to large water courses, such as Dog River. In addition, the Management Plan recommends no requests be considered for zoning changes to allow for increased densities in the Dog River and Bear Creek Basins. Commercial and industrial complexes are no longer permitted in the area.

Erosion and Sedimentation Control

Projects requiring an erosion and sedimentation control review must be submitted to the County Engineering Office where they are reviewed by the local staff, as well as the Soil Conservation Service representative of the West Georgia Soil and Water Conservation District, to determine if plans are in compliance with all state and local regulations. Upon approval, grading permits are issued.

To further ensure proper erosion and sedimentation control, the plan targets the need for a concerted effort between agencies to adequately monitor and enforce the already stringent regulations set forth by the State and County. Recommendations are: 1) periodic spot checks to ensure compliance with the regulation requiring storm water runoff discharging from sites not exceed 50 NTU higher than the level of the receiving stream immediately upstream of the site, 2) regular inspection visits to ensure that permitted soil and erosion control plans are being implemented and maintained in working order during construction periods with strict fines levied for non-compliance, 3) requirement of a performance bond for erosion and sedimentation control devices, 4) temporary and permanent storm water retention ponds which include a sedimentation area in addition to the volume required for storm water storage, 5) revision of the Douglas County Soil Erosion and Sedimentation Control structures on all land distributing activities regardless of size or type, including governmental activities such as road and sewer line construction.

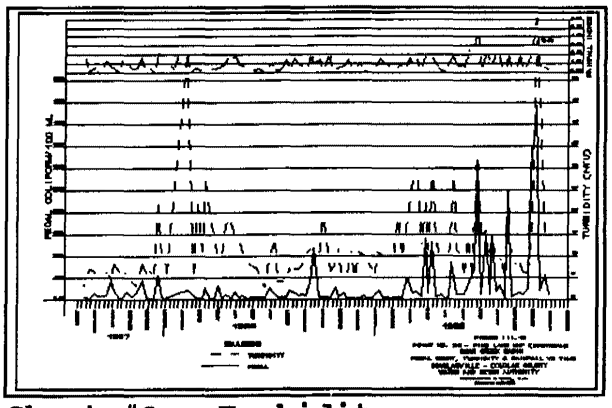


Chart #3 - Turbidity

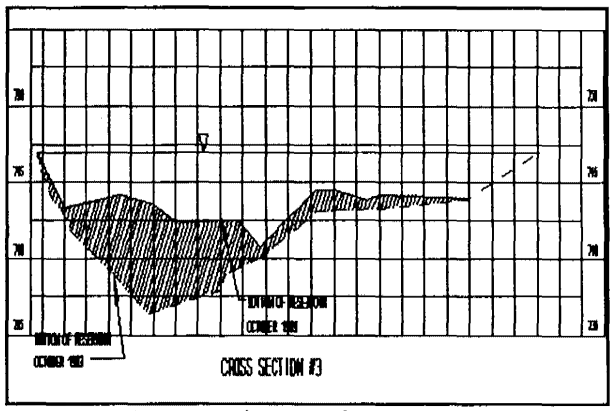


Chart #4 - Siltation

Overland Flow and Non-Point Source Discharges

The plan recognizes that overland flow, urban runoff and non-point source discharges can adversely affect water quality by introducing a high level of pollutants into the water system. A literature review indicated that the pollutant concentration in non-point source runoff from overland flow and urban flow can be decreased if routed to a storm water detention/sedimentation basin and released on a regulated basis (United States, Environmental Protection Agency 8-2).

The plan recommended a revision of the Douglas County ordinance to include: 1) requirements for the construction of a flow interceptor ditch across the entire tract of land to be constructed at the lowest contour level outside the 100-year flood plain to collect overland flow and divert it into a sedimentation/detention basin in areas of major land disturbing activity, 2) requirements for all areas where permits are required for a wet type detention basin to provide a sedimentation pool area to capture the first flush of urban runoff, 3) requirements to leave undisturbed buffer areas immediately adjacent to streams and other permanent and intermittent water courses.

Public Education

Public education should take the form of distribution of relevant materials to various interest groups throughout the county, discussion during public meetings and information provided through a customer newsletter. Additionally, a strong emphasis should be placed on an educational program through the local school system. Education of school children concerning pollution prevention and water conservation will provide, in the Authority's opinion, one of the best returns on public relations' dollars spent.

Low-Flow Water Fixtures

Water conservation measures must also be implemented to reduce the demands for water in the county while also reducing demand placed on septic tanks and absorption fields. The Plan therefore addresses several water saving methods that can be incorporated by local residences,

schools and commercial establishments to limit the daily use of water. These methods range from low-flow plumbing fixtures, such as toilets and shower heads, to low water demand landscape plans.

Monitoring

The Management Plan notes the value of the Authority's existing monitoring program which includes collection of samples regardless of weather conditions at established key points on the river, streams and tributaries; upstream and downstream sampling performed where there is known increased risk of pollution; and weekly samples taken to determine stream turbidity, pH and fecal coliform levels. Algae scans, dissolved oxygen, conductivity, ammonia nitrogen, ammonia, nitrate, ammonia nitrate levels, and metals are all evaluated on a quarterly basis.

IMPLEMENTATION

Implementation of the Plan has proven to be the most challenging aspect of the entire program. After the Plan was drafted, copies were sent to the Homebuilders Association, City and County officials, State Health Department officials, the Chamber of Commerce, Industrial Development Authority and other special interest groups such as the Concerned Citizens of Douglas County. A formal presentation was then given to each group individually, and comments were requested. The responses were reviewed and incorporated into the Plan where appropriate.

Zoning. Zoning matters, building setbacks and undisturbed buffer areas have been implemented without much difficulty and, in fact, received support from the environmental committee of the local Chamber of Commerce. Strategically, the Authority has incorporated the County Zoning Regulations into its Rules and Regulations and made compliance with the established zoning regulations a prerequisite for obtaining water service. This has the added benefit of providing support to the County Commission's defense of its zoning regulations. In addition, any waivers of the zoning requirement that are requested of the County must also be waived by the Authority if the use of the centralized water system is desired.

Erosion Control. Georgia law requires erosion and sedimentation control measures for all land disturbing activity that takes place, except with single lot development and governmental agencies and subdivisions of the state such as City and County government, the Authority and the Department of Transportation. Observation showed that these governmental agencies were often the biggest violators. After explaining the problem to these agencies, all have voluntarily agreed to comply with accepted erosion and sedimentation control measures. In fact, the Authority constructed 11 miles of silt fence and hay bales to protect the Dog River while the reservoir, which will envelope the river, is being constructed. Likewise, county right-of-way maintenance is being performed in a conscientious manner to minimize erosion problems and growth retardant chemicals are being used that will not adversely affect water quality.

NonPoint Sources. Overland flow and non-point source discharges have been addressed on two fronts. First, by the use of undisturbed buffer areas previously mentioned. Second, the County amended its design criteria and storm water management program with water quality issues, cost effectiveness and maintenance issues in mind.

Plumbing Fixtures. Douglas County and the City of Douglasville have both adopted building codes that require the use of low-flow plumbing fixtures. Although both entities had agreed to adopt the requirement based on the recommendations of the Plan, the process was aided by the State's requirement that low-flow fixture use be included in standard building code regulations in order for local political subdivisions to qualify for state grants and low interest loan funds.

This requirement was initially opposed by the Homebuilders Association because of the increased construction cost. In addition, they requested a reduction in both the water and sewer impact fee because of the reduced water usage and sewage generation. A review of our costs indicated that the charge currently levied was below actual cost, even considering the low flow fixtures. This opposition evaporated with the state mandate.

Septic Tank. Septic tank issues have been the most difficult to implement. When the local health department was approached regarding implementation and the establishment of a maintenance requirement, several unanticipated issues were uncovered. First, although the health department permits and inspects septic tank installation and has the power to mandate repairs when systems fail, state law does not give them the jurisdiction to mandate maintenance. Since failure is generally discovered when the effluent puddles on the ground surface and a complaint is registered by a neighbor, adverse environmental impacts have already occurred before any action is taken.

The Authority subsequently approached its local legislative delegation to submit special interest legislation that would give the Authority jurisdiction to establish septic tank maintenance requirements in the Dog River and Bear Creek drainage basins. The Authority's enabling legislation was amended and Authority regulation now requires that anyone who builds a facility in the watershed drainage areas after October 1, 1991 and is connected to an Authority water system must have the septic tank pumped at least once every five years. This requirement

is also included in the water meter contract that every customer signs in order to establish water service. Likewise, a manifest system is being established so that tracking of sludge pumped from septic systems is maintained by the Authority to ensure proper disposal.

Public education programs and water quality monitoring were both easily implemented by simply developing a strategy utilizing in-house personnel to achieve the desired goals and allocating the minimal financial resources necessary.

Coordination. The hallmark of the Authority's comprehensive Watershed Management Plan lies not only in its long-term preservation of water supplies for the residents of Douglas County and its contribution to overall environmental improvements, but also its coordination of a variety of agencies and groups with diverse special interests to accomplish a common goal. The far-reaching impacts of these accomplishments will be felt by generations of Douglas Countians to come.

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